

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Thomas Genger et al.

Application No.: 10/525,468

Confirmation No.: 3829

Filed: February 24, 2005

Art Unit: 1621

For: OXIDATION PROCESS

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Examiner: R. A. Keys

**APPEAL BRIEF**

MS Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Madam:

Appellants appeal the Examiner's decision rejecting claims 1, 8, and 12, as set forth in the Office Action of June 27, 2008.

**I. REAL PARTY IN INTEREST**

The real party in interest is assignee BASF SE. BASF Aktiengesellschaft acquired the entire rights in this application by assignment from the inventors, which was recorded on March 15, 2005 at Reel/Frame 015903/0694. On January 14, 2008, BASF Aktiengesellschaft converted from the legal form of a stock corporation (Aktiengesellschaft) to that of a Societas Europaea (SE), as evidenced by the copy of the notarized Certificate attached as Exhibit A. As such, BASF Aktiengesellschaft is now BASF SE.

## **II. RELATED APPEALS AND INTERFERENCES**

There are no other prior or pending appeals, interferences, or judicial proceedings known to Appellants which may be related to, directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

## **III. STATUS OF CLAIMS**

Claims 1, 8, and 12 are presently pending and stand rejected. Claims 2, 4, 5, 9, and 11, were cancelled in an amendment filed October 18, 2007. Claims 3, 6, 7, 10, and 13-20 were cancelled in an amendment filed October 27, 2008. The claims on appeal are claims 1, 8, and 12, which are reproduced in APPENDIX A.

## **IV. STATUS OF AMENDMENTS**

Appellants filed an amendment after final rejection on October 27, 2008 to (1) cancel claims 3, 6, 7, 10, and 13-20 without prejudice to pursuing such claims in a continuing application, (2) amend claim 1 to incorporate the features of cancelled dependent claims 6, 7, 10, 13, 14, 18, and 19, and (3) amend claims 1, 8, and 12 to place them in better form for allowance. The amendment was kindly entered by the Examiner, as indicated in an Advisory Action dated November 14, 2008, and accordingly, the claims are shown in APPENDIX A as amended on October 27, 2008.

## **V. SUMMARY OF CLAIMED SUBJECT MATTER**

Of the 3 claims on appeal, only claim 1 is independent.

Claim 1 recites a process for oxidizing cyclohexane with air to obtain a product (specification at page 1, lines 4-5; page 2, line 45 to page 3, line 2; page 3, line 40; and page 5, line 42), wherein said process comprises:

1. carrying out the oxidation in a rectification column (specification at page 1, line 9 and page 7, line 12) which comprises

- (a) a bottom region at the lower end (specification at page 1, line 10 and page 7, line 8),
  - (b) a top region at the upper end (specification at page 1, line 11 and page 7, line 9),
  - (c) a reaction zone between the top region and the bottom region (specification at page 1, line 12 and page 7, line 10), and
  - (d) and 20 to 40 theoretical plates, (specification at page 7, lines 39-41)
2. maintaining the reaction mixture in the boiling state in the reaction zone by means of a bottom evaporator (specification at page 1, lines 14-15; page 8, line 42; page 9, lines 23-25; Example 1; and Figure 1), and
3. introducing air into the reaction zone in at least two substreams (specification at page 1, lines 17-18 and page 10, lines 9-13);

wherein said oxidation is carried out in the presence of a homogenous catalyst (specification at page 10, lines 21-22); a product-containing reaction mixture is continuously withdrawn from said bottom region of said rectification column (specification at page 10, line 45 to page 11, line 5; and claim 14, as originally filed (page 14, lines 21-27)); water is by-produced in said oxidation (specification at page 11, lines 16-20); unconverted cyclohexane and said water are continuously removed during said oxidation from the top region of said rectification column (specification at page 11, lines 11-20; and page 14, lines 21-27 (claim 14, as originally filed)); said unconverted cyclohexane and said water are separated by means of a phase separator (specification at page 14, lines 21-27 (claim 14, as originally filed)); and said unconverted cyclohexane is recycled into said reaction zone via said top region of said rectification column as reflux (specification at page 14, lines 21-27 (claim 14, as originally filed)).

## **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

The sole ground of rejection for review on appeal is the rejection of claims 1, 8, and 12 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 3,349,007 to Ciborowski et al

(hereinafter, "Ciborowski") in view of U.S. Patent No. 3,957,876 to Rapoport et al. (hereinafter, "Rapoport") and U.S. Patent No. 5,449,501 to Luebke et al. (hereinafter, "Luebke") and further in view of U.S. Patent No. 2,931,834 to Crouch et al. (hereinafter, "Crouch") and Hawley's Condensed Chemical Dictionary, 12<sup>th</sup> ed., 1993, p. 1139 (hereinafter, "Lewis"). Ciborowski, Rapoport, Luebke, Crouch, and Lewis are attached hereto as Exhibits B, C, D, E, and F, respectively.

## VII. ARGUMENT

Independent claim 1 and dependent claims 8 and 12 stand rejected as obvious over Ciborowski in view of Rapoport and Luebke and further in view of Crouch and Lewis. The Examiner relies on Ciborowski for its disclosure of a process for oxidizing cyclohexane, but acknowledges that this reference does not teach using a rectification column as the reaction apparatus. Paragraph 10, pages 4-5 of the December 14, 2007 Office Action. To meet this limitation, the Examiner combines the disclosure of Ciborowski with that of Luebke. *Id.* Specifically, the Examiner takes the position that persons of ordinary skill in the art would have found it obvious to perform the Ciborowski process using the apparatus of Luebke. *Id.* Appellants respectfully disagree.

Ciborowski discloses an economically efficient distillation process for the recovery of oxidation products of cyclohexane, which has none of the disadvantages of prior art processes, using a specialized apparatus. Column 1, lines 11-48 of Ciborowski. This specialized apparatus is illustrated in the accompanying schematic diagram of Ciborowski and explained in detail at column 1, line 65 to column 2, line 40. The essence of the Ciborowski process and apparatus lies in compressing vapors of the distilled substance by means of an injector fed by vapors of the same substance and subsequently condensing these vapors in the heating coil of the distilling container. Column 1, lines 48-53 of Ciborowski. In doing so, Ciborowski teaches that separation of the condensate obtained by liquefaction of the vapors is not necessary, thus making it possible to avoid losses of cyclohexane associated with such separation. Column 1, lines 53-56 of Ciborowski.

Luebke discloses a vapor-liquid contacting column useful as a reactor in hydrocarbon conversion reactions, such as catalytic distillation. Column 1, lines 7-9 of Luebke. Figures 1 and 2 of Luebke illustrate that this reactor column has two “catalyst beds,” penetrated by a plurality of vertical vapor passageways which provided a means for vapor communication between fractionation sections located above and below that catalyst beds. Column 4, line 29 to column 6, line 20 of Luebke. Luebke neither teaches nor suggests that its reactor column is capable of performing the essential aspect of the Ciborowski process and apparatus discussed *supra*.

The Examiner admits that her proposed modification of the Ciborowski apparatus involves a wholesale substitution of the specialized apparatus of Ciborowski with the reactor column of Luebke. Page 6, lines 4-6 of the June 27, 2008 Office Action and Continuation Sheet of November 14, 2008 Advisory Action. Applicants submit that such a wholesale substitution of the apparatus of Ciborowski reactor column of Luebke would render the Ciborowski process unsatisfactory for its intended purpose and change its principle of operation. The Examiner asserts that the intended purpose of the Cibrowski process is merely to “recover the oxidation product of cyclohexane by distillation.” Continuation Sheet of November 14, 2008 Advisory Action. However, as discussed *supra*, the Ciborowski process involves more than simply recovering the oxidation product of cyclohexane by distillation. The principle of operation of the Ciborowski apparatus involves compressing the vapors of the distilled substance by means of an injector fed by vapors of the same substance, after which these compressed vapors are subsequently condensed in the heating coil of the distilling container. By doing this, the Ciborowski process eliminates any need to separate the condensate obtained by liquefaction of the vapors, making it possible to avoid losses of cyclohexane associated with such separation, which is the intended purpose of the Ciborowski process. Column 1, lines 48-56 of Ciborowski. Wholesale substitution of the specialized apparatus of Ciborowski with the reactor column of Luebke, as suggested by the Examiner, eliminates the ability to compress the vapors of the distilled substance by means of an injector fed by vapors of the same substance and to subsequently condense these compressed vapors in the heating coil of the distilling container. In

order to obtain the same results', the skilled artisan performing the Ciborowski process with the Luebke reactor column would be required to separate the condensate obtained by liquefaction of the vapors and, thus, would lose cyclohexane as a result of such separation. Thus, substituting the specialized apparatus of Ciborowski with the reactor column of Luebke would render the Ciborowski process unsatisfactory for its intended purpose by virtue of completely changing its principle of operation. Therefore, the skilled artisan would have no motivation to make such a substitution and the teachings of Ciborowski and Luebke are insufficient to render claim 1 *prima facie* obvious. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984); *In re Ratti*, 270 F.2d 810, 813 (CCPA 1959); MPEP §§ 2143.01 (V) and (VI). Furthermore, since claims 8 and 12 both depend directly from claim 1, Applicants submit that these claims are likewise non-obvious over these references. Applicants respectfully request that the obviousness rejection of claims 1, 8, and 12 be reversed.

#### **VIII. CLAIMS**

A copy of the claims involved in the present appeal is attached hereto as APPENDIX A.

#### **IX. EVIDENCE**

No evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 is being relied upon for this appeal. Accordingly, no such evidence is provided in APPENDIX B.

#### **X. RELATED PROCEEDINGS**

As stated in section II, *supra*, no related proceedings have been or are now pending. Accordingly, no related decisions are provided in APPENDIX C.

#### **XI. CONCLUSION**

For these reasons, reversal of the obviousness rejection under 35 U.S.C. § 103(a) of claims 1, 8, and 12 is strongly urged.

Payment in the amount of \$670.00 to cover the fees required by 37 C.F.R. §§ 41.20(b)(2) and 1.17(a)(1) for this Appeal Brief and a one-month extension of time is submitted concurrently herewith. Appellants believe no additional fees are due. However, the Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 03-2775, under Order No. 12810-00027-US, from which the undersigned is authorized to draw.

Dated: January 26, 2009

Respectfully submitted,

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**APPENDIX A – CLAIMS APPENDIX**

**Claims Involved in the Appeal of Application Serial No. 10,525,468**

1. (Previously Presented) A process for oxidizing cyclohexane with air to obtain a product, wherein said process comprises

1. carrying out the oxidation in a rectification column which comprises
  - (a) a bottom region at the lower end,
  - (b) a top region at the upper end,
  - (c) a reaction zone between the top region and the bottom region, and
  - (d) and 20 to 40 theoretical plates,
2. maintaining the reaction mixture in the boiling state in the reaction zone by means of a bottom evaporator, and
3. introducing air into the reaction zone in at least two

substreams;

wherein

said oxidation is carried out in the presence of a homogenous catalyst;

a product-containing reaction mixture is continuously withdrawn from said bottom region of said rectification column;

water is by-produced in said oxidation;

unconverted cyclohexane and said water are continuously removed during said oxidation from the top region of said rectification column;

said unconverted cyclohexane and said water are separated by means of a phase separator; and

said unconverted cyclohexane is recycled into said reaction zone via said top region of said rectification column as reflux.



Claims 2-7 (Cancelled)

8. (Previously Presented) The process of claim 1, wherein said process is carried out at a temperature in the range of from 10 to 300°C, as measured in the reaction zone.

Claims 9-11 (Cancelled)

12. (Previously Presented) The process of claim 1, wherein the starting material is fed to the reaction apparatus above the oxidizing agent when said starting material has a higher-boiling point than said oxidizing agent and wherein the oxidizing agent is fed to the reaction apparatus above the starting material when said oxidizing agent has a higher-boiling point than said starting material.

Claims 13-20 (Cancelled)

**APPENDIX B – EVIDENCE APPENDIX**

None.

**APPENDIX C – RELATED PROCEEDINGS APPENDIX**

None.